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SALES hereby certify that annexed is a true copy of the Provisional specification  
in connection with Application No. PQ2516 for a patent by WEEDBUG PTY  
LTD filed on 27 August 1999.

10/070223



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WEEDBUG PTY LTD

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

"MOTOR DRIVEN APPLICATORS"

This invention is described in the following statement:

"MOTOR DRIVEN APPLICATORS"

This invention relates to motor driven applicators for applying liquids particularly weedicides selectively to undesired  
5 plants in a field, garden, crop or the like.

Our co-pending International patent application No. PCT/AU98/00279 describes various forms of hand held motor driven applicators(referred to herein as "our earlier applicators") which have a rotor assembly driven by an internal combustion engine or  
10 an electric motor via an angle drive offset from the axis of rotation of the rotor assembly. While these previous applicators appear to be very effective, we have now invented a hand held motor driven applicator in which the rotor assembly is mounted to a central drive shaft whereby an offset drive is not utilised and  
15 additionally the rotor assembly can be supplied with liquid from a remote reservoir.

With the foregoing in view, the present invention resides broadly in a hand held motor driven applicator including:

- drive means having a drive housing;
- 20 a motor drivingly connected to said drive means;
- a rotor assembly connected to an output shaft of said drive means for rotation therewith about a vertical axis, said rotor assembly including application means adapted to make contact with undesired plants in a field, garden, crop or the like for applying  
25 liquids particularly weedicides thereto as the rotor assembly rotates, and storage means in liquid communication with said application means for storing a quantity of liquid to be supplied to said application means while said rotor assembly is rotating,

said storage means including an access opening for receiving a supply of liquid;

a reservoir mounted on said elongate handle or said drive housing in fluid communication with said storage means for  
5 supplying liquid to said storage means via said access opening while said rotor assembly is rotating, and

an elongate handle operatively connected to said drive housing by which a user may maintain said rotor assembly proximal to the surface of the field, garden or crop, whereupon said application  
10 means may apply liquid to selected undesired plants upon contact therewith.

Terms such as vertical, horizontal, upper and lower, are used herein for the purpose of description and illustration of the invention in the position it would normally be used for the  
15 application of weedicide to a field unless clearly not appropriate and are not intended to restrict the scope of the invention to any particular orientation.

In a preferred form, said drive means is a gearbox and said elongate handle is connected to the housing of said gearbox with  
20 the motor being mounted on the free end of the elongate handle and drivingly connected to the input shaft of the gearbox via a drive shaft housed in the elongate handle, the motor being either an internal combustion engine or an electric motor. However, in another form of the invention, the rotor assembly is direct driven  
25 by a small electric motor with the rotor assembly being mounted on the motor shaft or an extension of it, and the elongate handle is operatively connected to the motor housing with a battery pack being mounted at the other end of the handle thus balancing the

applicator. If a large battery powered motor is required this could be mounted at the end of the elongate handle remote from the rotor assembly to suitably balance the apparatus and the battery pack could be carried by the operator on his belt or back and be  
5 connected to the motor by suitable wires or the like.

Preferably, the reservoir is connected to the storage means by two hoses or other suitable conduits with one being arranged to allow flow of liquid from the reservoir to the storage means when the apparatus is in the normal in-use position and the other being  
10 arranged to vent the storage means to the reservoir. It is also preferred that the hoses or conduits be arranged to allow liquid in the storage means to return to the reservoir if the apparatus is placed in a stowed attitude with the rotor assembly above the reservoir. Advantageously, an operator is able to use the  
15 applicator continuously over a relatively large area without refilling as compared to our earlier applicators and furthermore, if a clear plastic container is used, the operator can easily maintain a watch on the liquid level to ensure a continuous supply. Additionally, upon completion of a days work the apparatus can be  
20 stood up with the rotor assembly higher than the reservoir whereupon the liquid in the storage means will return to the reservoir thus preventing crystallisation of liquid in the applicator means which can occur with some weedicides.

Preferably, said storage means is a chamber in said rotor  
25 assembly and said access opening provides access to the chamber from above when in the normal operating position(that is when the axis of rotation of the rotor assembly is vertical) and liquid is supplied to the chamber from the reservoir via a sealed space

between said rotor assembly and said drive means. In a preferred form of the invention, the rotor assembly includes a central hub (or hub portion) with a recess or chamber provided therein with a sealing face provided on its upper face which sealingly cooperates with a seal fitted to the underside of the housing of the drive means. In such form it is preferred that a second seal be provided about the output shaft to prevent liquid entering the drive means via the output shaft but in some cases the gearbox seal may be sufficient. However, some chemicals are very corrosive and thus it is preferred that the sealed space be such as to insulate the output shaft from the liquid. Advantageously, the two seals define a flow passage therebetween for passage of liquid from the reservoir to the chamber which achieve this result.

In another aspect the invention resides broadly in a hand held motor driven applicator including:

a motor;

a gearbox operatively connected to said motor for receiving drive therefrom;

a rotor assembly connected to an output shaft of said gearbox for rotation therewith about a vertical axis, said rotor assembly including application means adapted to make contact with undesired plants in a field, garden, crop or the like for applying liquids particularly weedicides thereto;

storage means in liquid communication with said application means for storing a quantity of liquid to be supplied to said application means while said rotor assembly is rotating; and

an elongate handle operatively connected to said gearbox by which a user may maintain said rotor assembly proximal to the

surface of the field, garden or crop, whereupon said application means may apply liquid to selected undesired plants upon contact therewith.

Some features of the hand held unit can be incorporated into  
5 tractor drawn applicators of the general type shown in Australian patent No. 589361 to Weedbug Pty Ltd with great advantage. Thus in another aspect the invention resides broadly in a motor driven applicator including:

a frame assembly adapted to be connected to a prime mover such  
10 as a tractor for travel across a field;

drive means mounted to said frame assembly for travel therewith;

a rotor assembly connected to an output shaft of said drive means for rotation therewith about a vertical axis, said rotor  
15 assembly including application means adapted to make contact with undesired plants in the field, garden, crop or the like for applying liquids particularly weedicides thereto;

storage means in liquid communication with said application means for storing a quantity of liquid to be supplied to said  
20 application means while said rotor assembly is rotating, said storage means including an access opening for receiving a supply of liquid; and

supply means for supplying liquid to said storage means via said access opening from a reservoir remote from said storage means  
25 while said rotor assembly is rotating. In such form, the reservoir could be mounted on the frame assembly or the tractor thus providing sufficient liquid for many hours of work with the supply means supplying liquid from said reservoir to said chamber via a

sealed space between said rotor assembly and said drive means as previously described.

In another aspect the invention resides broadly in a rotor assembly for a hand held motor driven applicator adapted to be  
5 connected to an output shaft of the drive motor or gearbox for rotation therewith about a vertical axis, said rotor assembly including a central hub portion forming at least in part a storage chamber for storing a quantity of liquid and a plurality of wicks adapted to make contact with undesired plants in a field, garden,  
10 crop or the like for applying liquid from the storage chamber thereto as the rotor assembly rotates, a portion of each wick passing through respective apertures in the hub portion, the rotor assembly being characterised in that the hub is moulded about the respective wick portions and restricts the flow of liquid through  
15 each wick.

In order that the invention may be more clearly understood and put into practical effect, reference will now be made to the accompanying drawings wherein:

Fig. 1 is a sectional elevation of the applicator head  
20 of a hand held motor driven applicator according to the present invention in the normal in-use orientation;

Fig. 2 is a pictorial representation of the main components of the applicator head of Fig. 1, being a rotor assembly, a seal, a rotor cowl and a gearbox, in-line for  
25 assembly;

Fig. 3 is a plan view of the rotor cowl shown in Fig. 2;

Fig. 4 is a sectional elevation of the rotor cowl of Fig. 3 along line 3-3;



Fig. 5 is an underside plan view of the rotor assembly shown in Fig. 2;

Fig. 6 is a sectional view of the rotor assembly of Fig. 5 along line 5-5;

5            Fig. 7 is a sectional elevation of the gear box shown in Fig. 2 through a diametral plane;

Fig. 8 is a sectional plan view of the gear box shown in Fig. 2 along line 7-7.

Fig. 9 is a plan view of the seal shown in Fig. 2; and

10           Fig. 10 is a sectional elevation of the seal of Fig. 9 along line 9-9;

Fig. 11 is a sectional elevation showing the main components of another applicator head for a hand held motor driven applicator according to the present invention in the normal in-use  
15 orientation;

Fig. 12 is a sectional elevation of the gearbox of the applicator of Fig. 11, and

Figs. 13a, 13b and 13c are upper and lower plan views and end elevation of the bottom plate of the gearbox of Fig.12.

20           The hand held motor driven applicator 10 illustrated in the drawings includes an applicator head having four main components being a rotor assembly 11, a rotor cowl 12, a seal 13 and an angle drive gearbox 14, the rotor assembly being powered by a small two stroke petrol engine 15 spaced from the applicator head and  
25 transferring rotary drive to the gearbox via a drive shaft 16, the shaft being housed in a hollow tube 17 which is secured at its upper end to the engine frame and at its lower end to the housing 18 of the gearbox. The engine, drive shaft and shaft housing are

of the type used on hand held motor driven brush cutters but the angle drive is specially designed and constructed for the present invention.

5 The rotor assembly 11 is fitted to the output shaft 19 of the angle drive gear box 14 for rotation therewith in the rotor cowl which is secured to the bottom plate 18a of the gearbox housing by bolts 22 which engage in threaded apertures provided in thickened portions 23 of the side wall 18b of the housing as more clearly shown in Figs. 7 and 8. It will be appreciated that the applicator  
10 can be operated in a manner similar to that of our earlier applicators.

The angle drive gear box has some similarities with angle drive gear boxes of the type used on hand held brush cutters having an inclined input shaft and a vertical output shaft. However, the  
15 gearing arrangement is a two stage planetary system in order to achieve the desired speed reduction. The inclined input shaft 24 has a bevel gear 26 thereon which co-operates with a complementary beveled gear 27 secured to an upper vertical shaft 28. The upper end of the shaft 28 is mounted in a bearing 29 which in turn is  
20 mounted in the gearbox housing 18. At its other end the shaft has a sun gear 31 mounted thereon with a central recess 32 provided in its underside in which a bearing 33 is mounted for supporting the inner end of the output shaft 19. The output shaft 19 is also supported in a bearing 34 spaced from the bearing 33 and mounted  
25 in the bottom plate 18a. In the present embodiment, drive is transferred from the sun gear 31 to eight planetary gears 37 which engage ring gear 35 fitted to the side wall 18b of the housing, the planetary gears in turn being shaft mounted on a ring gear 38

thereby causing it to rotate. The ring gear 38 coacts with a lower sun gear 39 which in turn coacts with the eight lower planetary gears 41 which are mounted on the lower arm gear 42 causing it to rotate and also the output shaft 19 which is secured thereto. The  
5 gearbox in this embodiment achieves a speed reduction of eleven to one.

The rotor assembly 11 has a central hub 51 which is screw threadedly mounted on the output shaft 19 with an annular cup-like wall 52 formed about the hub and a disk 53 extending outwardly from  
10 the hub and the cup-like wall, the hub, the wall and the disk together forming an annular chamber 56 adapted to store liquid therein. A plurality of wicks 57 are attached to the underside of the disc 53 with their inner ends extending into the storage chamber and are adapted to apply liquid chemical to undesired  
15 plants upon rotation of the rotor assembly in a manner similar to that described in relation to our earlier applicators. It will be seen that the disc 53 has a flat upper surface 53a and that it is incomplete above the chamber to provide an access opening 58 into the chamber extending fully around the hub 51.

20 The hub 51 extends above the disc 53 to provide a cylindrical sealing face 51a for the lip seal 13 which is fitted between the cowl 14 and the upper face 53a of the disc with the seal being abutted against the underside of the cowl and stationary with the outer lip 62 of the seal sealingly engaging against the upper face  
25 53a as the rotor assembly rotates. The seal also includes an inner lip 63 which engages against the outer cylindrical face 51a. It will be appreciated that if a cowl is not included, the seal will be fitted between the bottom cover 18a and the disc and operate in

the same manner. Effectively the seal acts to provide a sealed space 64 which provides access for supplying liquid to the storage chamber 56 via the access opening 58 as the rotor assembly rotates.

Liquid is supplied to the storage chamber 56 from a reservoir 5 66 mounted on the handle 17 adjacent the motor via a plastic tube 67. The plastic tube is secured to the gear box housing 18 by a cover plate 68 and is connected to a liquid supply fitting 69 which is sealingly secured to the seal 61. The supply fitting has an outlet tube 71 which protrudes into the storage chamber through the 10 access opening 58. It will be understood that the outlet tube remains in a stationary position and liquid can be supplied to the storage chamber while the disc is rotating and it will be seen that the seal 61 prevents the egress of liquid from the storage chamber and the ingress of dirt and dust. If further sealing is required 15 in this regard a double lip seal could be utilised.

A vent tube 72 is also fitted to the supply fitting opening above the desired liquid level in the chamber simply opens within the reservoir 66 above the liquid level and is more clearly shown in Fig. 2.

20 In use the reservoir 66 is filled with weedicide or other liquid to be applied to the weeds in a crop or around trees and the liquid flows through the tube 67 into the storage chamber 56 via the supply fitting 69 and outlet 71 whether the rotor assembly is stationary or rotating. As the applicator is used, the liquid 25 continues to flow in as space in the storage chamber becomes available. If the rotor assembly requires replacement or if the seal 61 requires replacement the rotor assembly can be simply unscrewed from the output shaft and either component replaced.

The hand held motor driven applicator 109 illustrated in Fig. 11 is very similar to that of Fig. 1 and accordingly corresponding components will be referenced by the same numbers but prefaced by a "1" unless not appropriate. One difference is that the unitary seal 13 has been replaced by two seals 113a and 113b. Seal 113a includes a soft component 113ax which is fixed to the bottom plate 118a of the gearbox 114 and a hard component 113ay which is fixed to the rotor disk 153 via an insert 150 included for ease of manufacture, the two components abutting against respective sealing faces as well known in the art of mechanical seals. The seal 113b has two similar components 113bx and 113by which are mounted radially inward of the components of seal 113a with the soft component being fixed to the bottom plate and the hard component to the disk so as to form an annular space between the two seals through which liquid may enter the annular chamber 156 around the hub 151 along path "A". In this case it can be seen that the bottom plate of the gearbox has two hubs 191 and 192 extending downwardly on which the seal components 113ax and 113bx are mounted and the liquid supply passage 171 opens through the lower face of the hub 191 between the two seals. A vent passage 172 also opens through the same face but circumferentially spaced from the supply outlet and shown in Figs. 13a, 13b and 13c. Advantageously, the two seals operate independently, and thus can accomodate significant imperfections in the disk 153 without leakage of liquid from the storage chamber 156. The supply tube 167(not shown) and a vent tube 173(not shown)are connected to the passages 171 and 172 respectively via standard BSP fittings 174 screwed into the passage inlet openings 171a and 172a respectively. Both tubes are then

connected to the supply reservoir 166(not shown) which is mounted on the elongate handle 117, the supply tube opening into the reservoir below the in-use liquid level and the vent tube above it. In this arrangement, in use liquid flows continuously to the  
5 chamber 156 from the reservoir via the supply tube and is vented by the vent tube, but when the applicator is stood up at the end of a days work the liquid in the storage chamber returns to the reservoir via the vent tube and the supply tube becomes the vent.

A plurality of wicks 157 are attached to the underside of the  
10 disc 53 with their inner ends extending into the storage chamber 156 as described in relation to Fig. 1, but in this case the cup-like wall 152 of the disk is moulded around the wicks thus reducing manufacturing costs considerably. Suitably, the wicks are in a reduced diameter state when the wall is being moulded thus forming  
15 providing the desired throttling of the wick flow passage as previously achieved by a gland. Furthermore, the outer ends of the wicks are moulded into respective blind holding block portions of the disk which form caps for the ends of the wicks.

Various other modifications of the invention are contemplated  
20 which will be apparent to persons skilled in the art, and which can be resorted to without departing from the spirit and scope of the invention as is herein setforth.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A hand held motor driven applicator including:

drive means having a drive housing;

5 a motor drivingly connected to said drive means;

a rotor assembly connected to an output shaft of said drive means for rotation therewith about a vertical axis, said rotor assembly including application means adapted to make contact with undesired plants in a field, garden, crop or the like for applying  
10 liquids particularly weedicides thereto as the rotor assembly rotates, and storage means in liquid communication with said application means for storing a quantity of liquid to be supplied to said application means while said rotor assembly is rotating, said storage means including an access opening for receiving a  
15 supply of liquid;

a reservoir mounted on said elongate handle or said drive housing in fluid communication with said storage means for supplying liquid to said storage means via said access opening while said rotor assembly is rotating, and

20 an elongate handle operatively connected to said drive housing by which a user may maintain said rotor assembly proximal to the surface of the field, garden or crop, whereupon said application means may apply liquid to selected undesired plants upon contact therewith.

25

2. An applicator according to Claim 1, wherein said drive means is a gearbox and said elongate handle is connected to the housing of said gearbox with a motor being mounted on the free end of the

elongate handle and drivingly connected to the input shaft of the gearbox via a drive shaft housed in the elongate handle.

3. An applicator according to Claim 1, wherein the rotor assembly  
5 is direct driven by an electric motor with the rotor assembly being mounted on the motor shaft or an extension of it.

4. An applicator according to Claim 1, wherein the reservoir is a refillable container mounted on the elongate handle and connected  
10 to the storage means by a hose or other suitable conduit.

5. An applicator according to any one of the preceding Claims, wherein said storage means is a chamber in said rotor assembly and said access opening provides access to the chamber from above when  
15 in the normal operating position(that is when the axis of rotation of the rotor assembly is vertical) and the supply means supplies liquid to said chamber via a sealed space between said rotor assembly and said drive means.

20 6. An applicator according to Claim 5, wherein said sealed space is formed between two seals, one defining an outer wall of the space and the other defining an inner wall of the space.

7. A hand held motor driven applicator including:  
25 a motor;  
a gearbox operatively connected to said motor for receiving drive therefrom;



a rotor assembly connected to an output shaft of said gearbox for rotation therewith about a vertical axis, said rotor assembly including application means adapted to make contact with undesired plants in a field, garden, crop or the like for applying liquids  
5 particularly weedicides thereto;

storage means in liquid communication with said application means for storing a quantity of liquid to be supplied to said application means while said rotor assembly is rotating; and

an elongate handle operatively connected to said gearbox by  
10 which a user may maintain said rotor assembly proximal to the  
surface of the field, garden or crop, whereupon said application means may apply liquid to selected undesired plants upon contact therewith.

15 8. A motor driven applicator including:

a frame assembly adapted to be connected to a prime mover such as a tractor for travel across a field;

drive means mounted to said frame assembly for travel  
therewith;

20 a rotor assembly connected to an output shaft of said drive means for rotation therewith about a vertical axis, said rotor assembly including application means adapted to make contact with undesired plants in the field, garden, crop or the like for applying liquids particularly weedicides thereto;

25 storage means in liquid communication with said application means for storing a quantity of liquid to be supplied to said application means while said rotor assembly is rotating, said

storage means including an access opening for receiving a supply of liquid; and

supply means for supplying liquid to said storage means via said access opening from a reservoir remote from said storage means while said rotor assembly is rotating. In such form, the reservoir could be mounted on the frame assembly or the tractor thus providing sufficient liquid for many hours of work with the supply means supplying liquid from said reservoir to said chamber via a sealed space between said rotor assembly and said drive means as previously described.

9. A rotor assembly for a hand held motor driven applicator adapted to be connected to an output shaft of the drive motor or gearbox of the applicator for rotation therewith about a vertical axis, said rotor assembly including a central hub portion forming at least in part a storage chamber for storing a quantity of liquid and a plurality of wicks adapted to make contact with undesired plants in a field, garden, crop or the like for applying liquid from the storage chamber thereto as the rotor assembly rotates, a portion of each wick passing through respective apertures in the hub portion, the rotor assembly being characterised in that the hub is moulded about the respective wick portions and restricts the flow of liquid through each wick.

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Dated this 27<sup>th</sup> day of August 1999

WEEDBUG PTY LTD

by their Patent Attorneys

AHEARNES

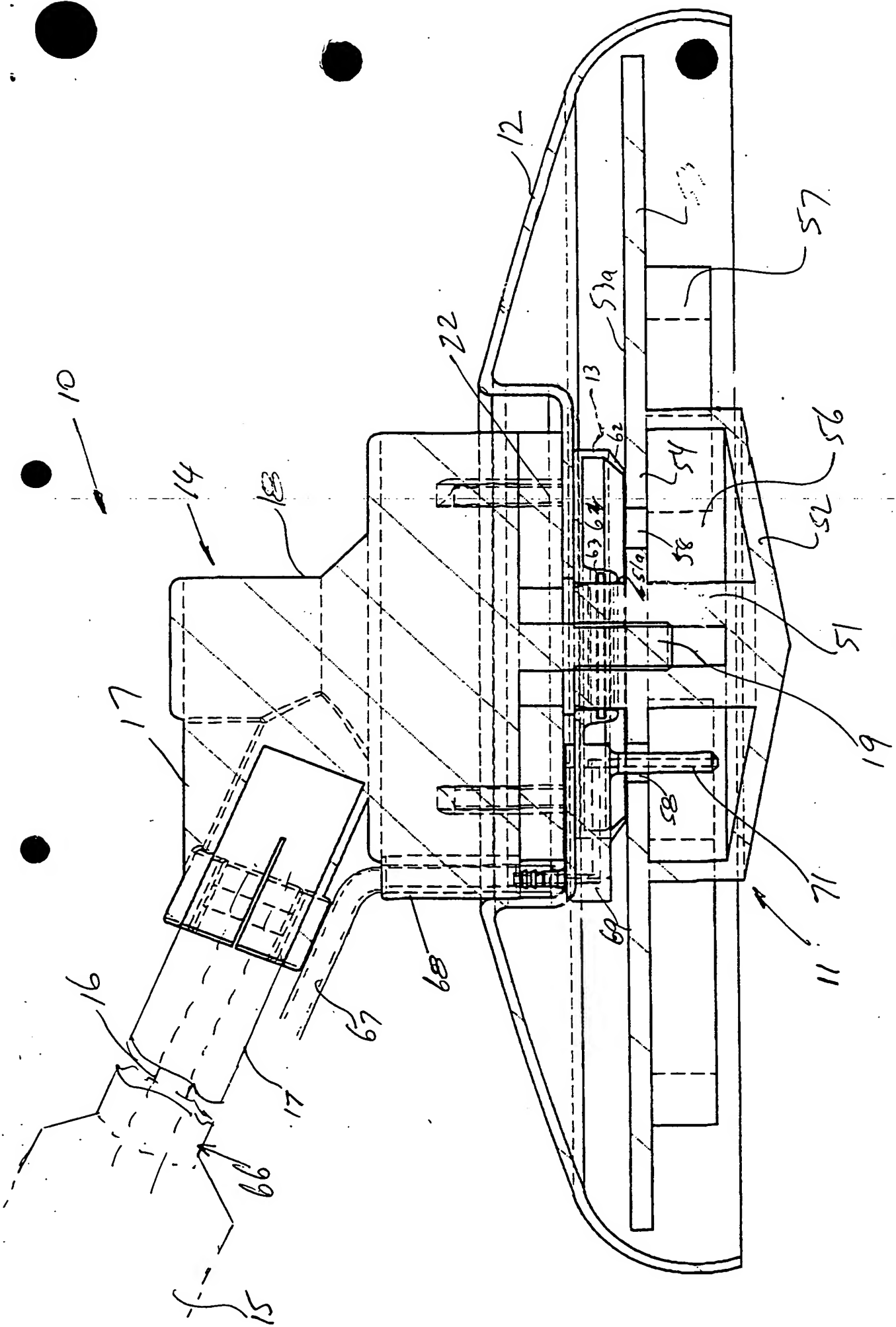


Fig 1

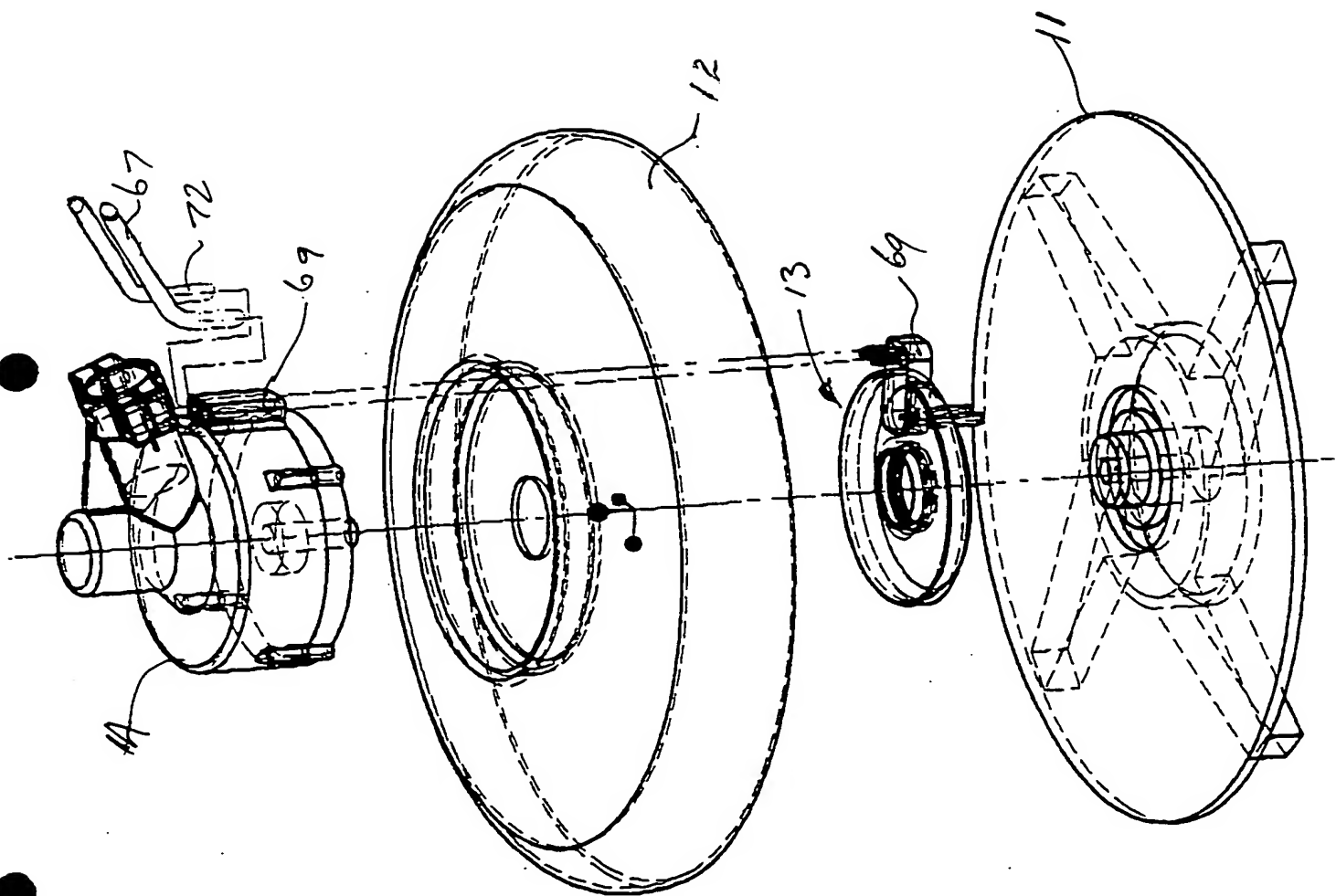


Fig. 2

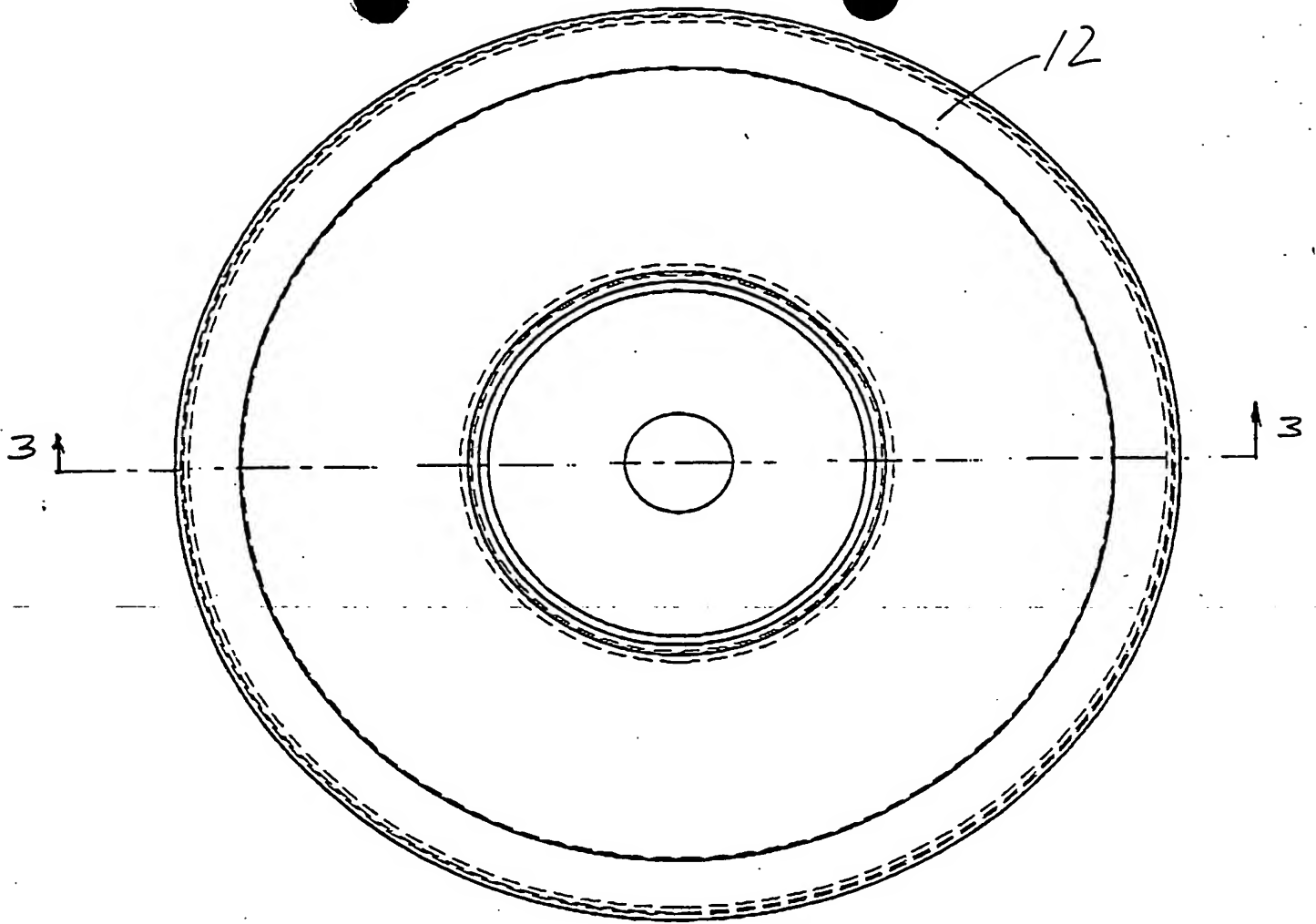


Fig. 3

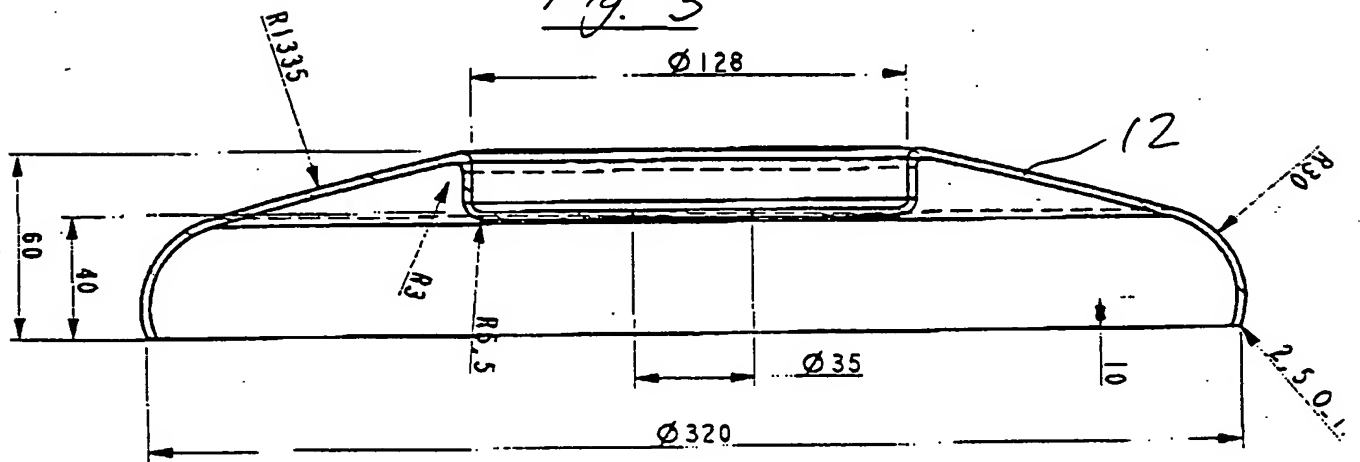


Fig. 4

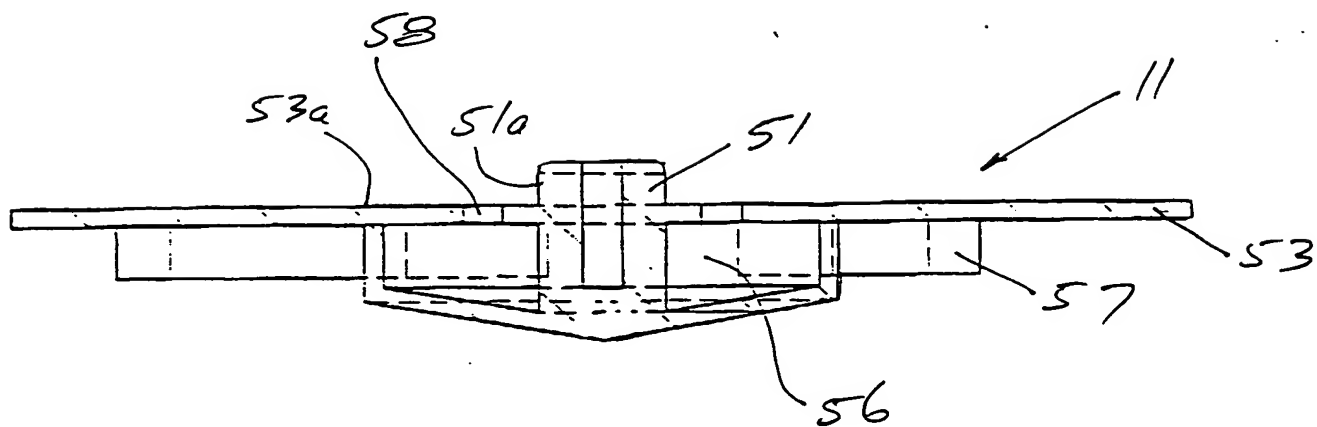


Fig 6

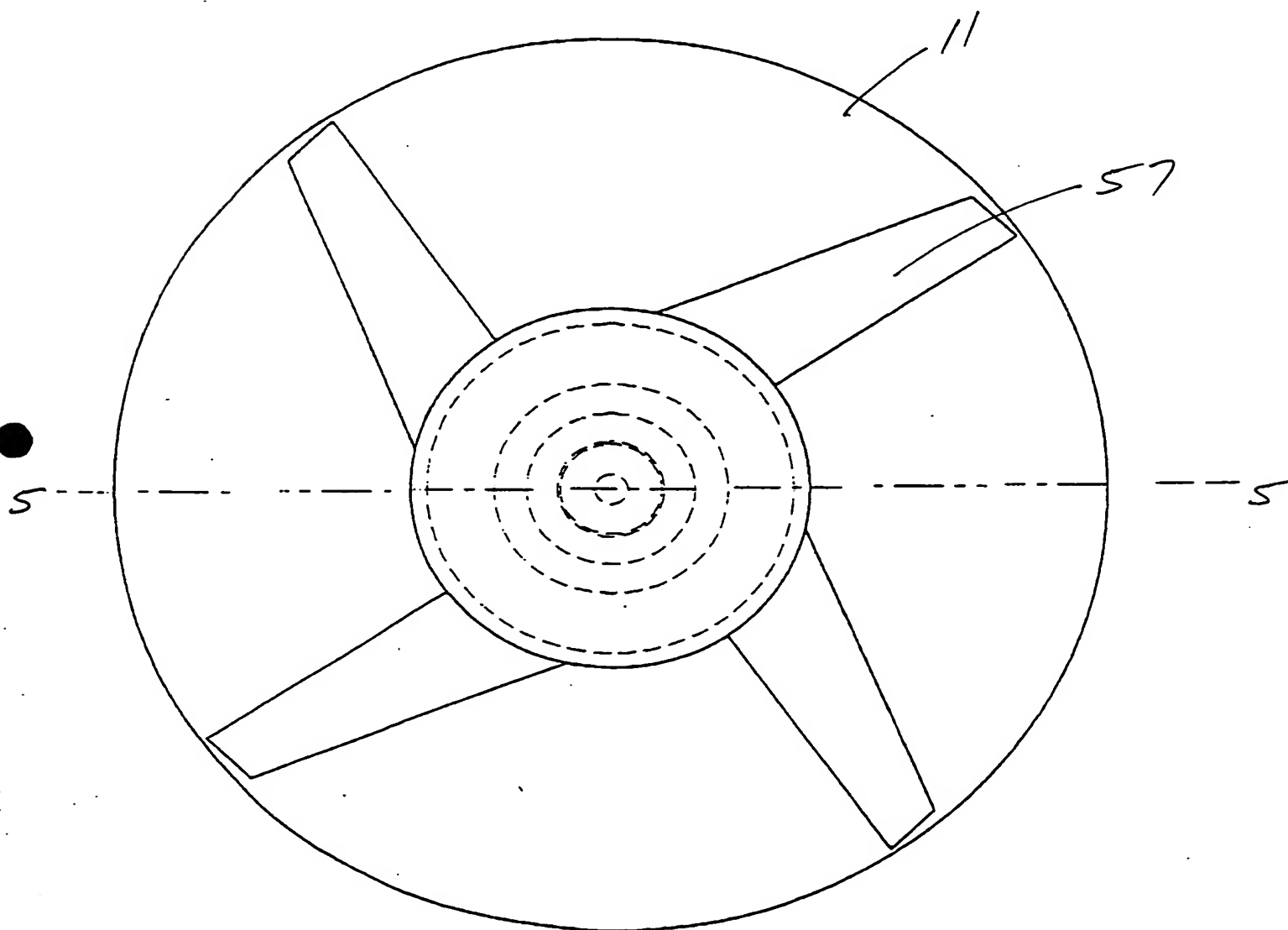
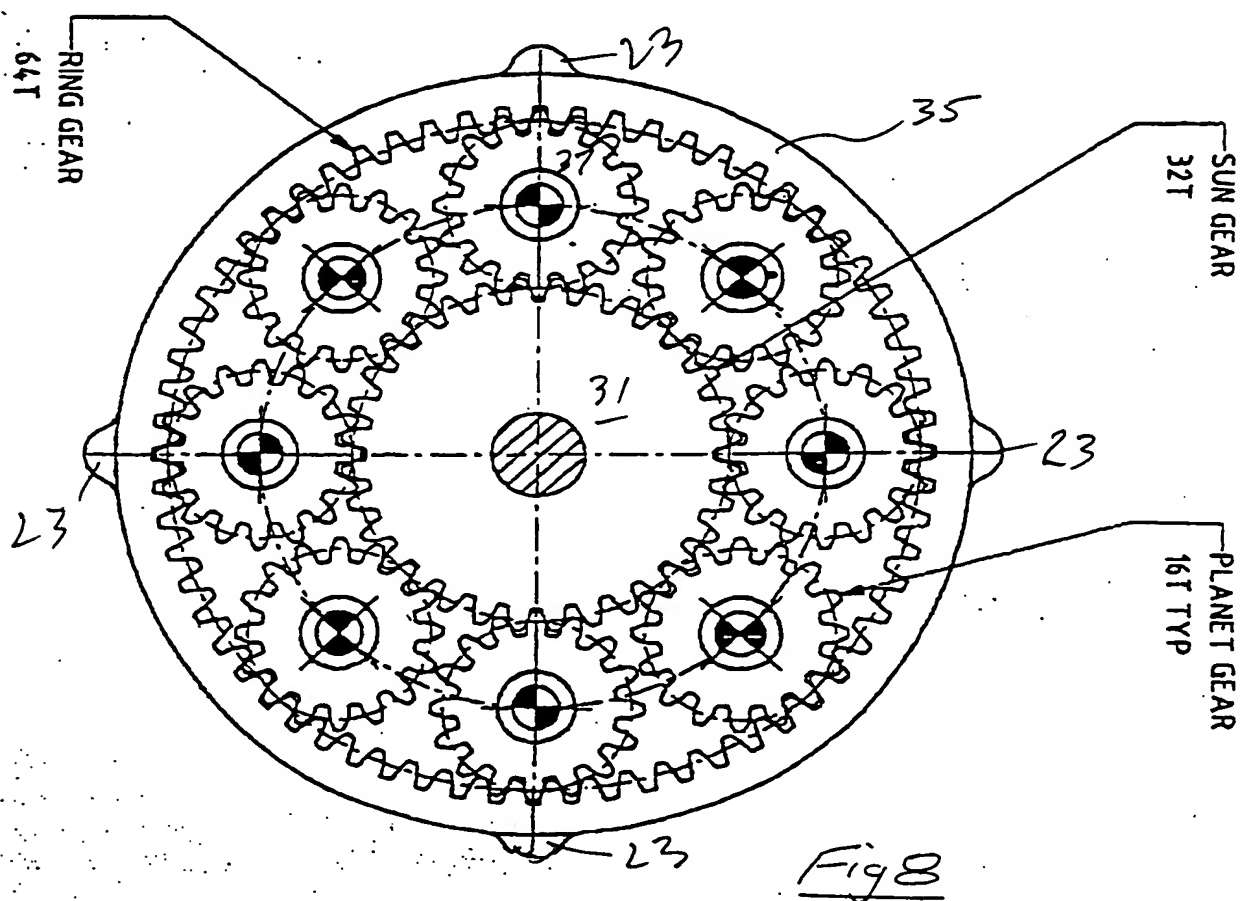
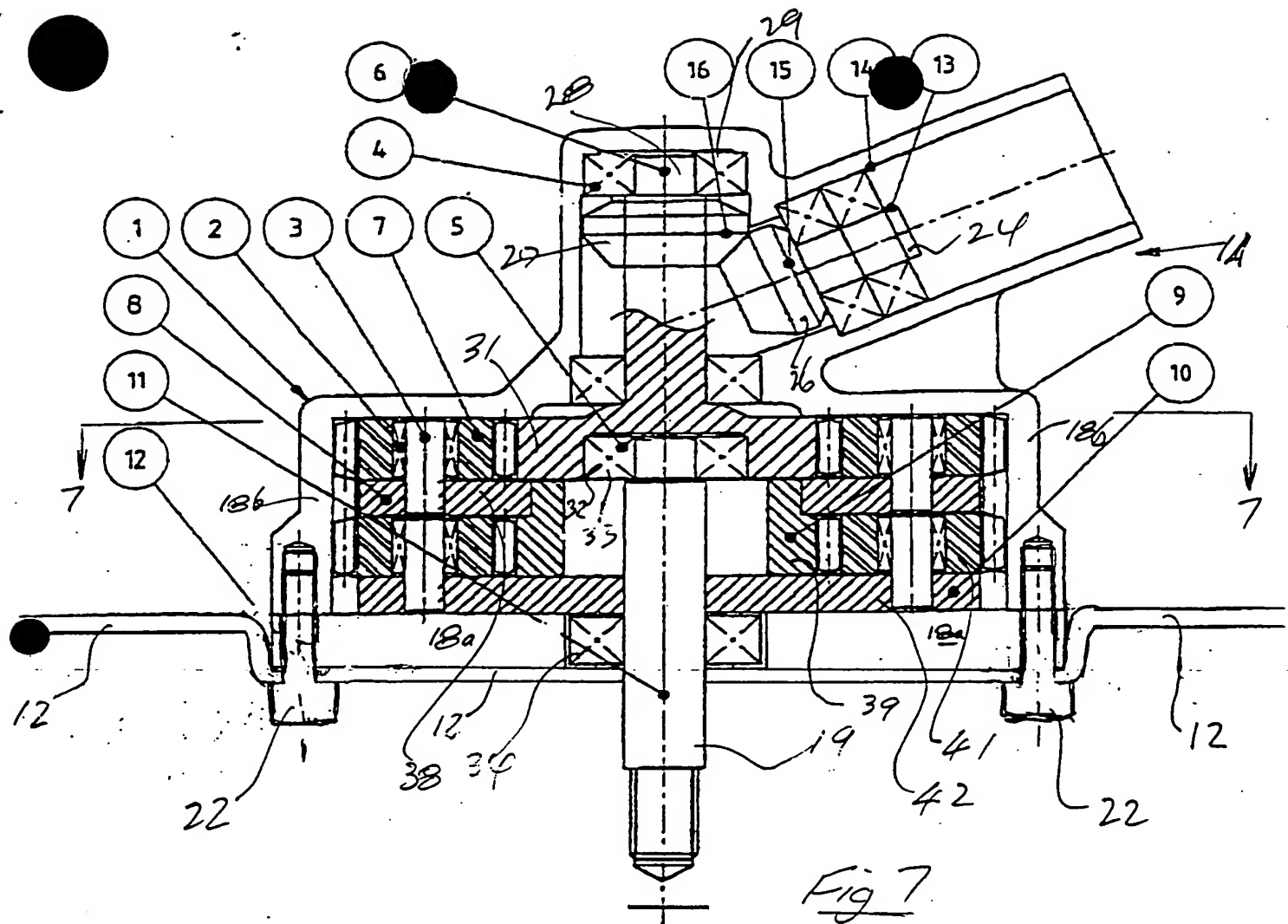


Fig 5



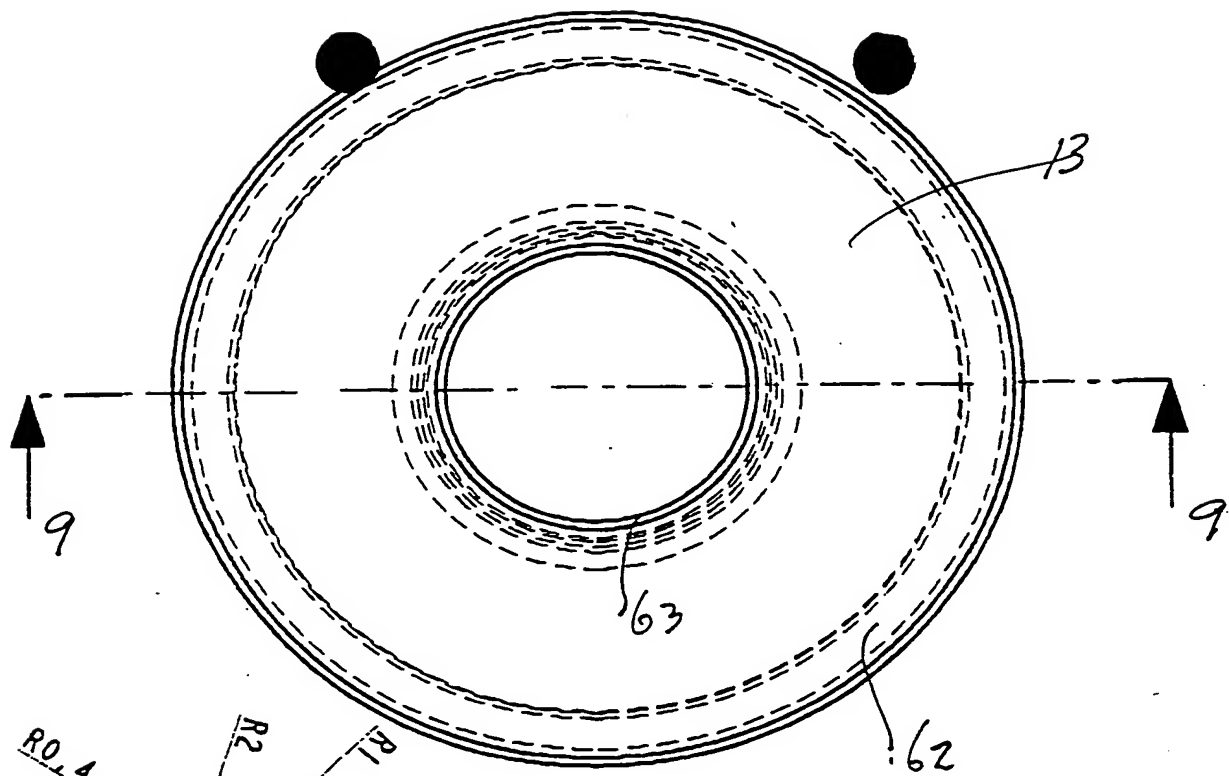
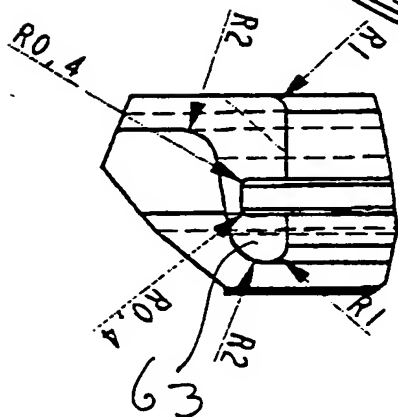


Fig 9



Detail A

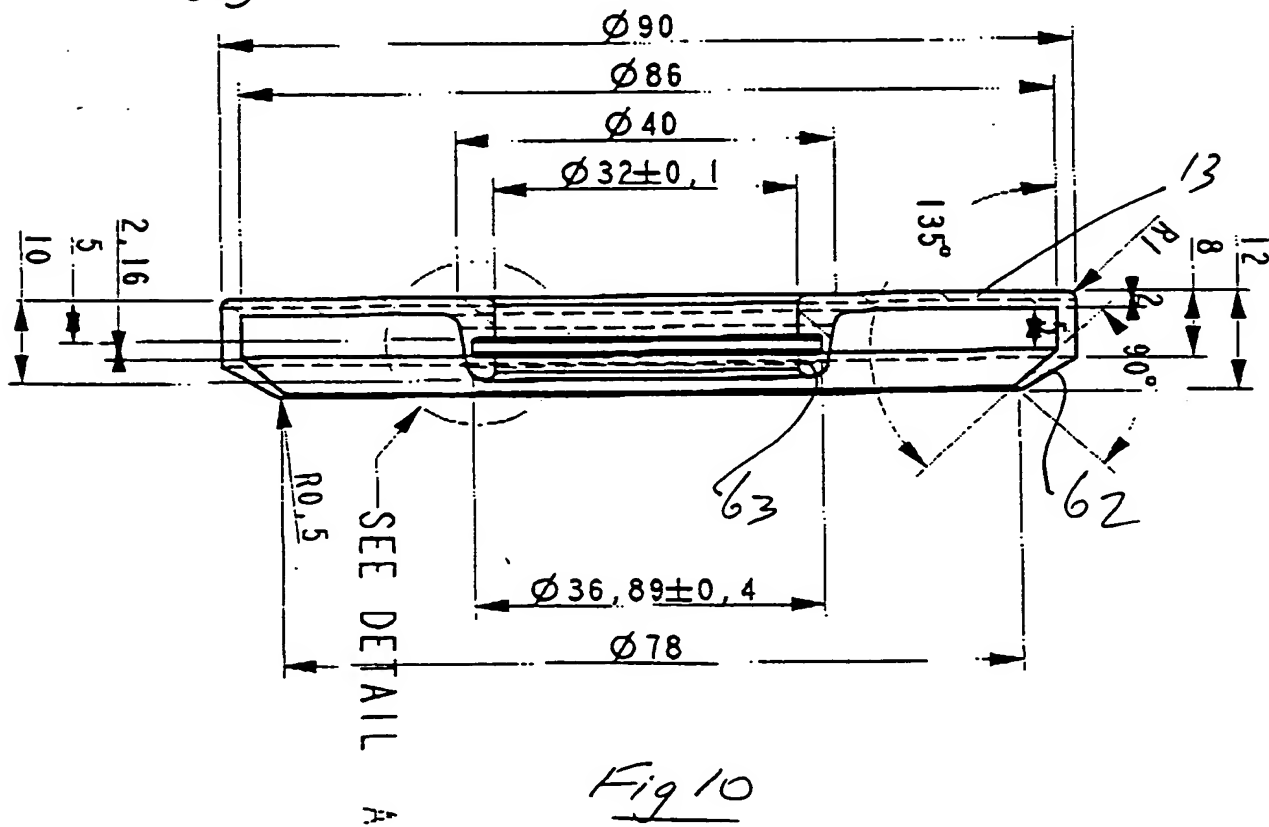
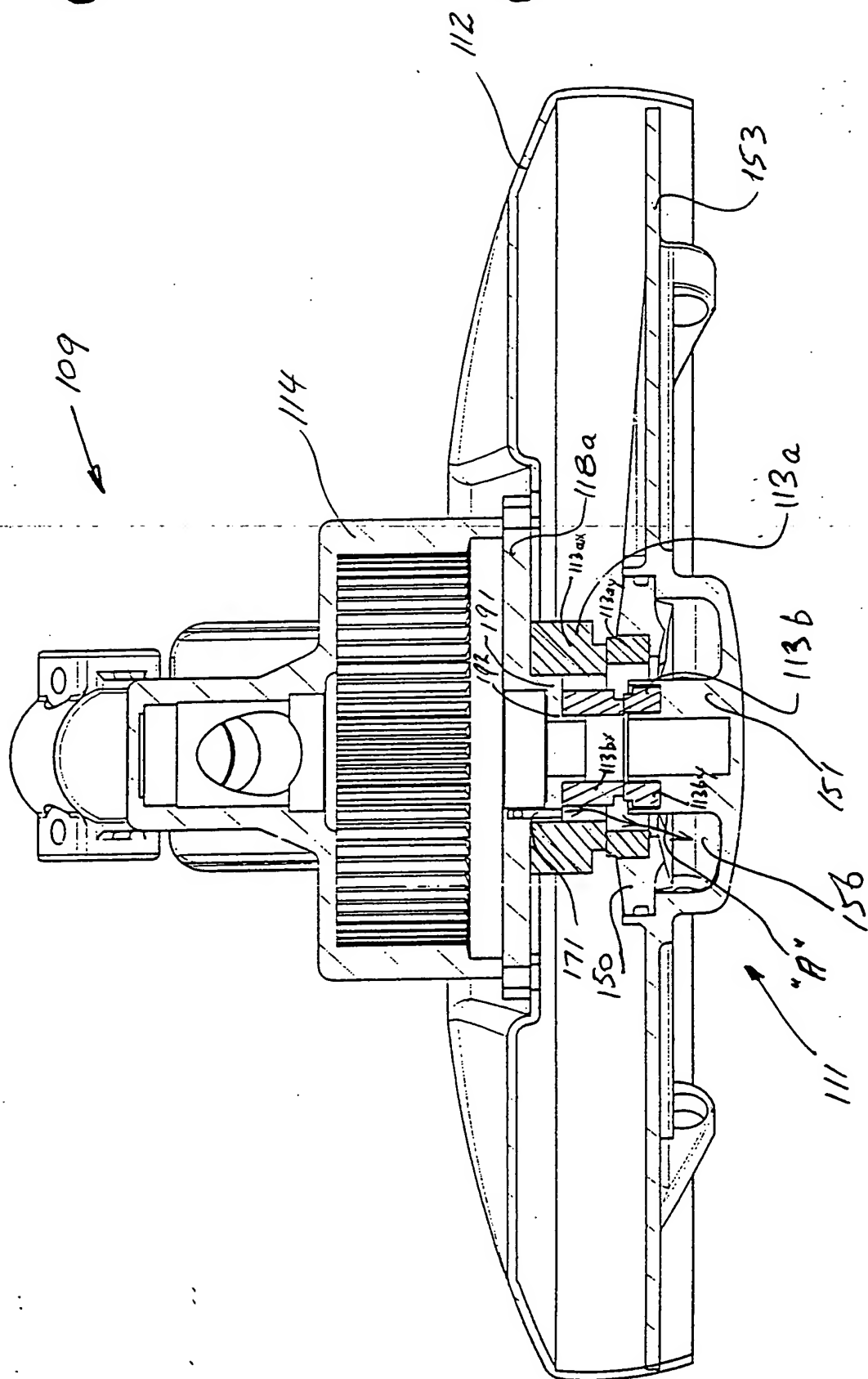


Fig 10



Fig. 11

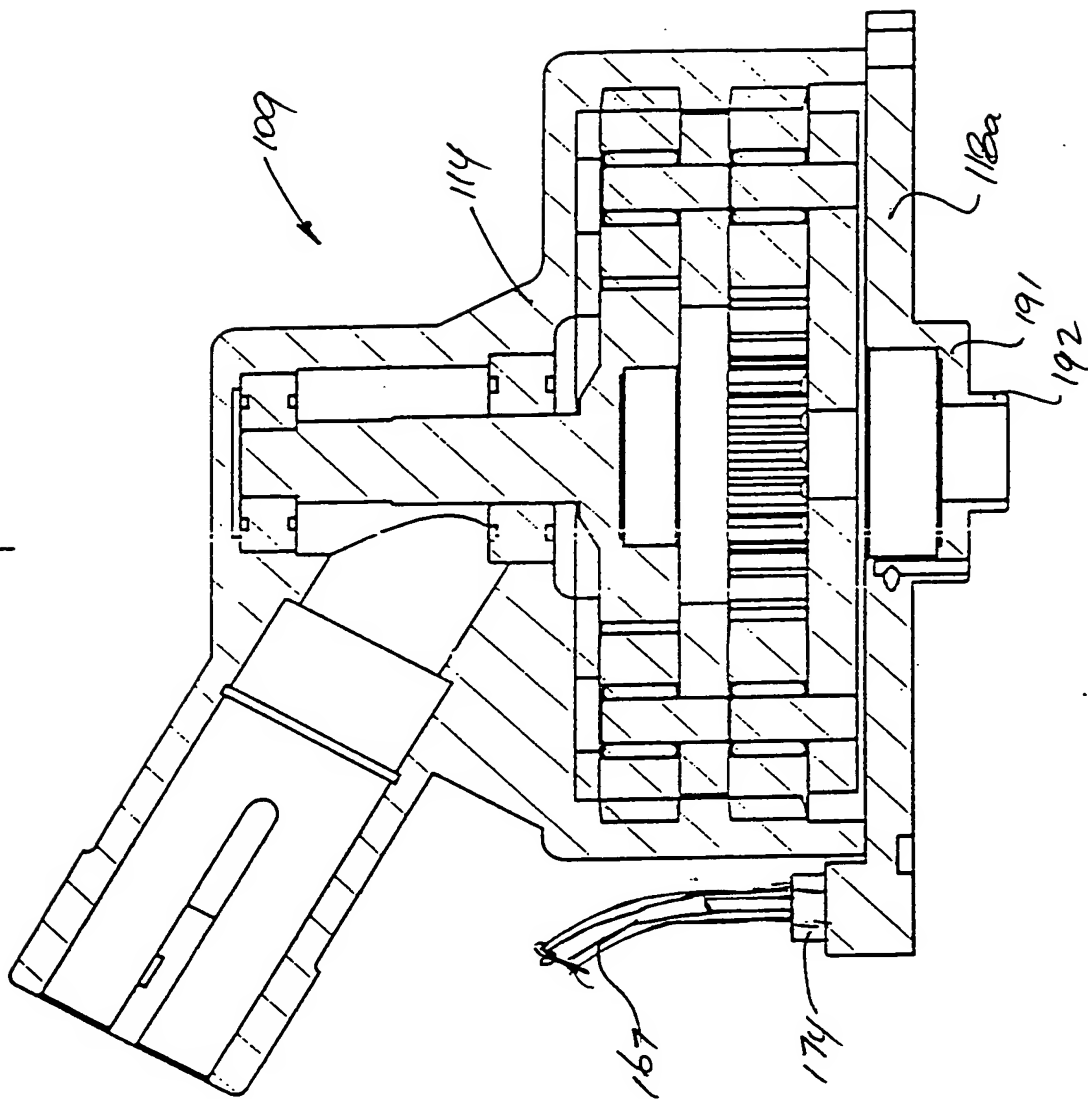


Fig 12

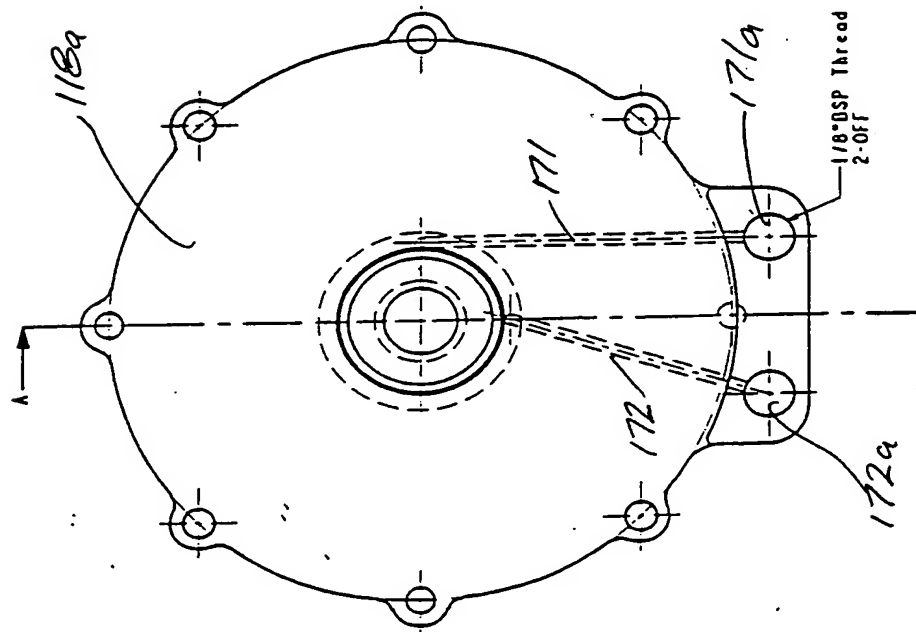


Fig 13a

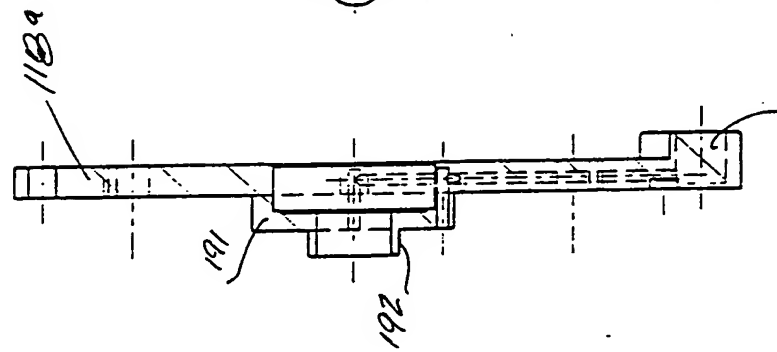


Fig 13c

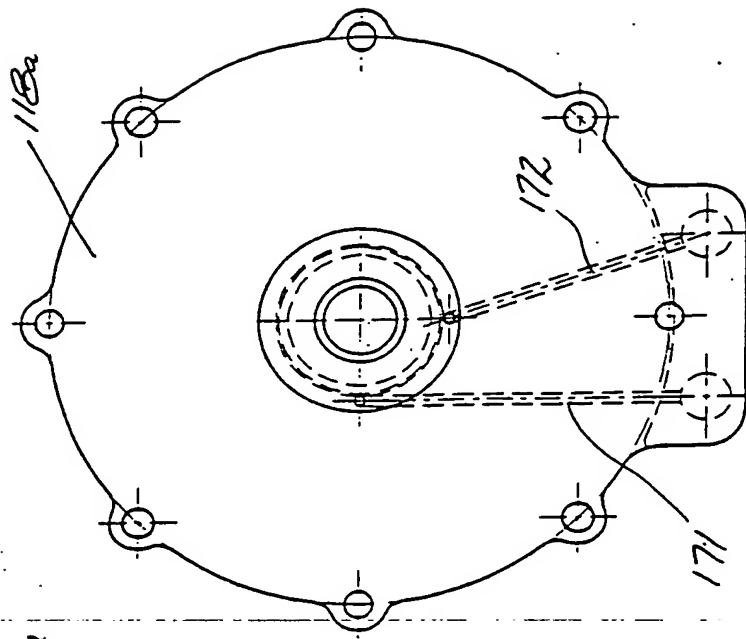


Fig 13b

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